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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

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**Issues relating to the Globally Harmonized System
of Classification and Labelling of Chemicals: Use
of the Manual of Tests and Criteria in the context
of the GHS**

Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals

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Item 2 (a) of the provisional agenda

**Work of the TDG Sub-Committee on matters of
interest to the GHS Sub-Committee**

Revision of the Manual of Tests and Criteria: Part I: Section 10

**Transmitted by the Chairman of the Working Group on Explosives on
behalf of the Working Group**

Note by the secretariat:

This document takes account of the amendments to the 6th revised edition of the Manual of Tests and Criteria adopted by the Committee at its eighth session (see ST/SG/AC.10/44/Add.2).

PART I

CLASSIFICATION PROCEDURES, TEST METHODS AND CRITERIA RELATING TO EXPLOSIVES ~~OF CLASS 1~~

CONTENTS OF PART I

NOTE 1: The country or organization of origin of each test method is indicated in brackets after each test name.

NOTE 2: The test method recommended for use with each test type is indicated in **bold** and by an asterisk (see subsection 1.6 of the General Introduction).

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SECTION 10

INTRODUCTION TO PART I

10.1 Purpose

10.1.1 Part I of the Manual presents the United Nations scheme for the classification of explosives. It includes a description of the procedures and test criteria considered to be the most useful for providing ~~competent authorities with~~ the necessary information to arrive at a proper classification of explosive substances and articles ~~for transport~~. It should be used in conjunction with the classification flow charts in figures 10.1, 10.2, 10.3, 10.4 and 10.5, the general conditions for testing in sub-section 1.5 and the appropriate test prescriptions in sections 11 to 18 of this Manual.

10.1.2 ~~Goods of Class 1~~ Explosives, other than unstable explosives, are assigned to one of six divisions, depending on the type of hazard they present (see Chapter 2.1, paragraph 2.1.1.4 of the Model Regulations and Chapter 2.1, paragraph 2.1.2 of the GHS); and, for some regulatory purposes (e.g. transport), to one of the thirteen compatibility groups ~~which that~~ identify the kinds of explosives ~~substances and articles~~ that are deemed to be compatible. The general scheme for classifying a substance or article which is to be considered for inclusion in the class of explosives Class 1 is illustrated in Figure 10.1. The assessment is in two stages. In the first stage, the potential of a substance or article to explode ~~should be~~ is ascertained and its stability and sensitivity, both chemically and physically, ~~shown to be acceptable~~ are also determined. In order to promote uniform assessments by competent authorities, it is recommended that, using the flow chart in Figure 10.2, data from suitable tests is analyzed systematically with respect to the appropriate test criteria. If the substance or article is provisionally accepted into the class of explosives Class 1, it is then necessary to proceed to the second stage and assign it to the correct division by use of the flow chart of Figure 10.3 and 10.5. With the exception of Compatibility Groups N and S, for which test data is necessary, assignment to a compatibility group, when required, is usually made without reference to testing. In the case of Compatibility Group S, the tests may be waived by the competent authority if classification by analogy is based on test results for a comparable article.

10.1.3 The test procedures allow assessment of the hazard of explosive substances and articles so that an appropriate classification ~~for transport~~ can be ~~made~~ assigned. When appropriate this is done by the competent authority.

10.2 Scope

10.2.1 New products which are considered as having explosive properties or are intended to function as explosives should first be considered for inclusion in the class of explosives Class 1. For substances such as self-reactive substances ~~of Division 4.1~~ or organic peroxides ~~of Division 5.2~~, refer to Part II of this Manual. In this context a new product is one which, in the opinion of the competent authority, involves any of the following:

- (a) A new substance ~~or a combination or mixture of substances~~, intended to function as an explosive or pyrotechnic, which is considered to be significantly different from other ~~combinations or mixtures~~ substances already classified;
- (b) A new substance ~~or article~~, not intended for explosive use, which has, or is suspected of having, explosive properties (see Chapter 2.1, paragraph 2.1.3.1.2§ of the Model Regulations and Chapter 2.1, paragraph 2.1.1.2 of the GHS);

Note by the secretariat: *The reference in the list amendments reads: "2.1.3.1". The Sub-Committee is invited to confirm the correct reference to be used.*

- (c) A new design of article containing an explosive substance or an article containing a new explosive substance ~~or a new combination or mixture of explosive substances~~; or
- (d) A new design of package for an explosive substance or article including a new type of inner packaging or a new arrangement of articles. (A relatively minor change to an inner or outer packaging can be critical and can convert a lesser risk-hazard into a mass explosion risk-hazard or vice versa).

~~The classification procedure should be undertaken before a new product is offered for transport.~~

10.2.2 The producer, or other applicant for the classification of a new product, should provide adequate information concerning the names and characteristics of all explosive substances in the product and should furnish the results of all relevant tests which have been done.

10.3 Acceptance procedure

10.3.1 *General description*

10.3.1.1 The acceptance procedure is used to determine whether or not a ~~substance or article~~~~product as offered for transport~~ is a candidate for ~~the class of explosives Class 1~~. This is decided by determining whether a substance provisionally accepted ~~into the class of explosives for Class 1~~ is either too insensitive for inclusion in ~~the class of explosives Class 1~~ or ~~is accepted as an unstable explosive (and considered too dangerous for transport)~~; or whether article(s) or packaged article(s) are ~~accepted as an unstable explosive (and considered too dangerous for transport)~~.

10.3.2 *Test types*

10.3.2.1 The test methods used for deciding provisional acceptance into ~~the class of explosives Class 1~~ are grouped into four series, numbered 1 to 4, and designed to provide the information necessary to answer the questions in Figure 10.2.

10.3.2.2 The question "Is it an explosive substance?" (box 4, Figure 10.2) is answered on the basis of national and international definitions of an explosive substance and the results of three types of Series 1 tests to assess possible explosive effects. The three types of test used are:

- Type 1 (a): a shock test with defined booster and confinement to determine the ability of the substance to propagate a detonation;
- Type 1 (b): a test to determine the effect of heating under confinement; and
- Type 1 (c): a test to determine the effect of ignition under confinement.

10.3.2.3 Series 2 tests are used to answer the question "Is the substance too insensitive for acceptance into ~~the class of explosives Class 1~~?" (box 6, Figure 10.2). In general the basic apparatus used is the same as that for Test Series 1 but with less stringent criteria, e.g. in the case of gap tests, the gap used is greater than zero. The following three types of test are used:

- Type 2 (a): a shock test with defined initiation system and confinement to determine sensitivity to shock;
- Type 2 (b): a test to determine the effect of heating under confinement; and
- Type 2 (c): a test to determine the effect of ignition under confinement.

Figure 10.1: OVERALL SCHEME OF THE PROCEDURE FOR CLASSIFYING A SUBSTANCE OR ARTICLE IN THE CLASS OF EXPLOSIVES

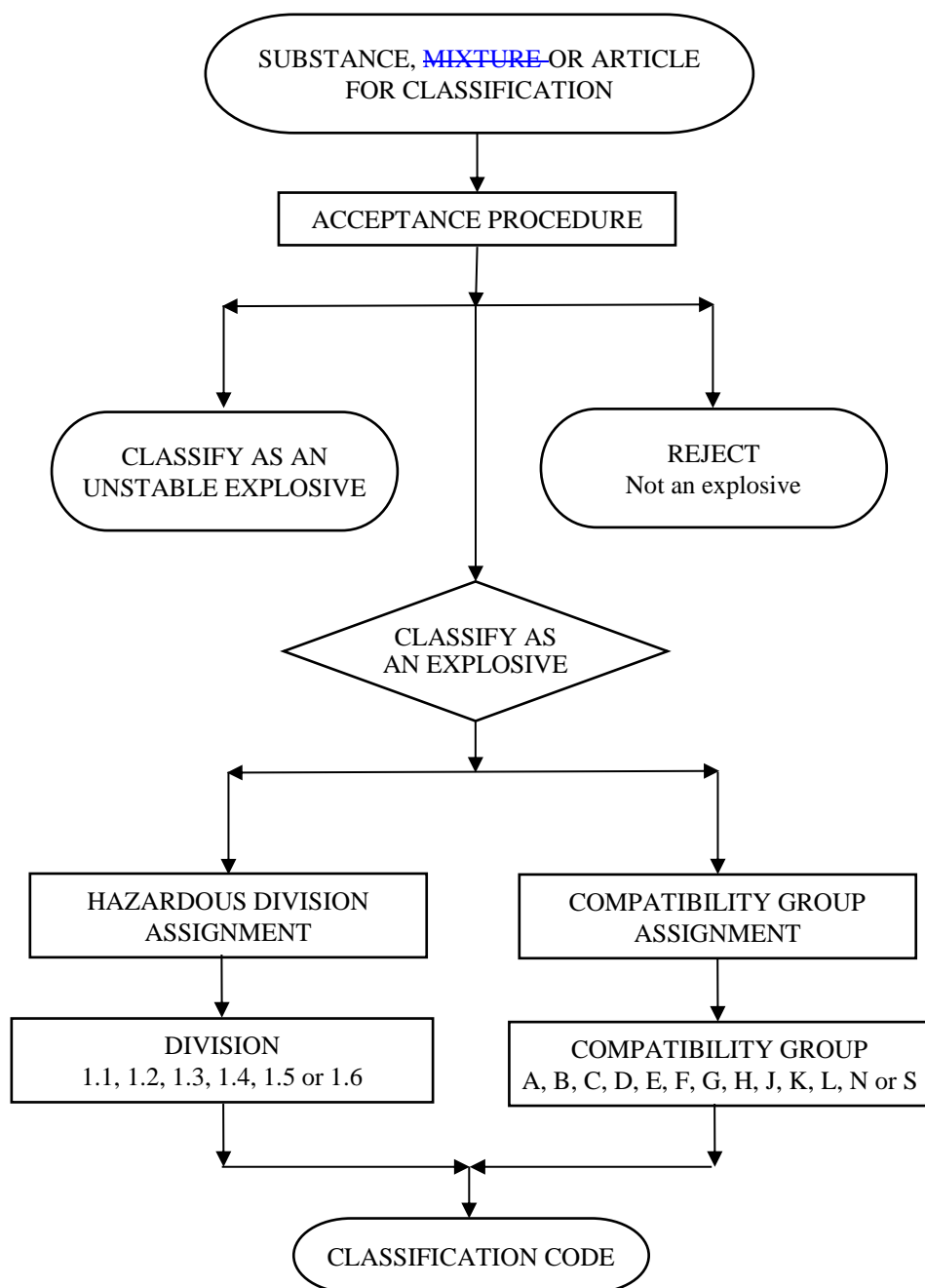
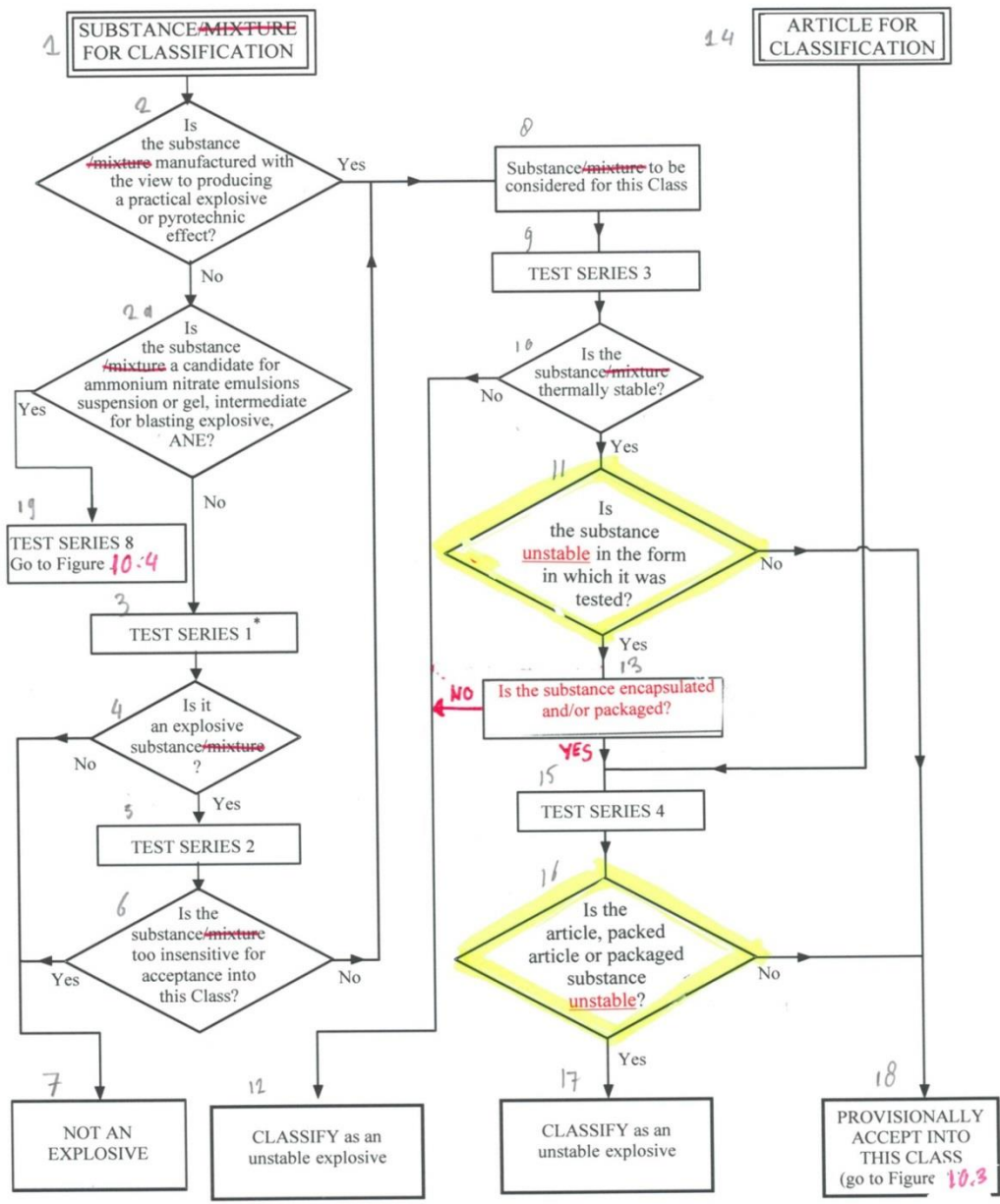


Figure 10.2: PROCEDURE FOR PROVISIONAL ACCEPTANCE OF A SUBSTANCE OR ARTICLE INTO THE CLASS OF EXPLOSIVES 1



* For classification purposes, start with test series 2.

10.3.2.4 Test series 3 is used to answer the questions "Is the substance thermally stable?" (box 10, Figure 10.2) and "Is the substance ~~too dangerous for transport~~ unstable in the form in which it was tested?" (box 11, Figure 10.2). This involves tests for determining the sensitiveness of the substance to mechanical stimuli (impact and friction), and to heat and flame. The following four types of test are used:

- Type 3 (a): a falling weight test to determine sensitiveness to impact;
- Type 3 (b): a friction, or impacted friction, test to determine sensitiveness to friction;
- Type 3 (c): an elevated temperature test to determine thermal stability; and
- Type 3 (d): an ignition test to determine the response of a substance to fire.

10.3.2.5 Series 4 tests are intended to answer the question "Is the article, packaged article or packaged substance ~~too dangerous for transport~~ unstable?" (box 16, Figure 10.2). Typical conditions which may ~~occur during transport~~ be encountered include high temperature and high relative humidity, low temperature, vibration, bumping and dropping. The two types of test to be carried out are:

- Type 4 (a): a test of thermal stability for articles; and
- Type 4 (b): a test to determine the hazard from dropping.

10.3.3 *Application of the test methods*

10.3.3.1 The numbering of test series 1 to 4 relates to the sequence of assessing the results rather than the order in which the tests are conducted. ***It may be important for the safety of experimenters that certain preliminary tests, using small amounts of material, be conducted first before proceeding to experiment with larger quantities.*** The results of these preliminary tests may also be used in the classification procedure.

10.3.3.2 The acceptance procedure for substances designed to have a practical explosive or pyrotechnic effect starts with the application of test series 3 to determine if the substance is too sensitive for transport in the form in which it is tested. If the substance passes all tests, the procedure for the assignment to the appropriate division is applied. If the substance fails any of the tests, it is forbidden for transport in the form tested. A substance which fails test type 3 (c) may be altered and resubmitted to test type 3(c). A substance which fails test types 3 (a), 3 (b) or 3 (d) may be encapsulated or packaged to reduce sensitiveness to external stimuli and submitted to test type 4(b).

10.3.3.3 All articles as presented for transport (packaged or unpackaged) should be subjected to test series 4. However, if there is sufficient information to indicate that the article would not be too dangerous for transport, the competent authority may decide to waive all or part of these tests for the article. If the product passes all the required tests in test series 4, the procedure for assignment to the appropriate division is applied. If the product fails any of the required tests, it is forbidden for transport in the form tested, but may be modified or repackaged and resubmitted to test series 4. If the competent authority suspects that the product may be subject to stimuli other than those specified in test series 4 resulting in potentially dangerous effects, additional information or tests may be required (see note under paragraph 2.1.3.3.1 of the Model Regulations).

10.3.3.4 Although test series 1 indicates whether a substance, not designed to have an explosive effect, has in fact potentially explosive properties, again it is more appropriate to start the testing procedure with test series 3. These tests involve relatively small sample sizes, which reduces the risk to test personnel. If test series 3 indicates that a substance is too sensitive for transport in the form in which it is tested, then the procedures for reducing its sensitiveness to external stimuli, outlined in 10.3.3.2, should be applied. If test series 3 indicates that the substance is not too sensitive for transport, the next step is the application of test series 2 which determines whether the substance is too insensitive for inclusion in Class 1. There is no real need to perform test series 1 at this point in the acceptance procedure since test series 2 answers the pertinent question regarding the degree of insensitiveness of the substance. Test series 1 is concerned with the resolution of questions relating to the explosive nature of the substance. The procedure for assignment to a division of Class 1 should be applied to substances which fail test series 2 but pass test series 3 i.e. they are not too insensitive for acceptance into Class 1 nor are they thermally unstable or too dangerous to transport in the form in which they are tested. It is important to note that a substance which fails test series 2 may still, if properly packaged, leave Class 1 provided that the product is not designed to have an explosive effect and does not exhibit any explosive hazard in test series 6 of the assignment procedure.

10.3.3.5 If articles contain expensive, inert, control components, for testing purposes these may be replaced by inert components having a similar mass and volume.

10.4 Procedure for assignment to a division of the class of explosives ~~Class 1~~

10.4.1 *General description*

10.4.1.1 ~~Goods of Class 1~~ Unless classified as unstable explosives are assigned to one of six divisions, depending on the type of hazard they present (see paragraph 2.1.1.4 of the Model Regulations and 2.1.2 of the GHS). The assignment procedure (Figure 10.3 and 10.5) applies to all substances and/or articles that are candidates for this class ~~Class 1~~ except those declared from the outset to be in Division 1.1. A substance or article is should be assigned to the division which corresponds to the results of the tests to which it the substance or article, as offered for transport, has been subjected. Other test results, and data assembled from accidents which have occurred, may also be taken into account. As indicated in box 36 of Figure 10.3, there is authority to exclude an article from ~~Class 1~~ the class of explosives by virtue of test results and the ~~Class 1~~ "explosives" definition (see paragraph 2.1.1.1(b) of the Model Regulations and paragraph 2.1.1.2 (b) of the GHS). Specific criteria by which articles may be excluded from the class of explosives (for transport) may be found in the Model Regulations (see paragraph 2.1.3.6.4).

Note by the secretariat: *The secretariat notes that the reference "(for transport)" is missing in the list of amendments. The Sub-Committee is invited to clarify whether this text should be kept or deleted.*

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10.4.2 *Test types*

10.4.2.1 The test methods used for assignment to a division are grouped into three series - numbered 5 to 7 - designed to provide the information necessary to answer the questions in Figure 10.3. The tests in series 5, 6 and 7 should not be varied unless the ~~national~~ competent authority is prepared to justify such action internationally.

10.4.2.2 The results from three types of series 5 tests are used to answer the question "Is it a very insensitive explosive substance with a mass explosion hazard?" (box 21, Figure 10.3). The test types are:

- Type 5 (a): a shock test to determine the sensitivity to intense mechanical stimulus;
- Type 5 (b): thermal tests to determine the tendency for transition from deflagration to detonation;
and
- Type 5 (c): a test to determine if a substance, when in large quantities, explodes when subjected to a large fire.

Figure 10.3: PROCEDURE FOR ASSIGNMENT TO A DIVISION OF THE CLASS OF EXPLOSIVES

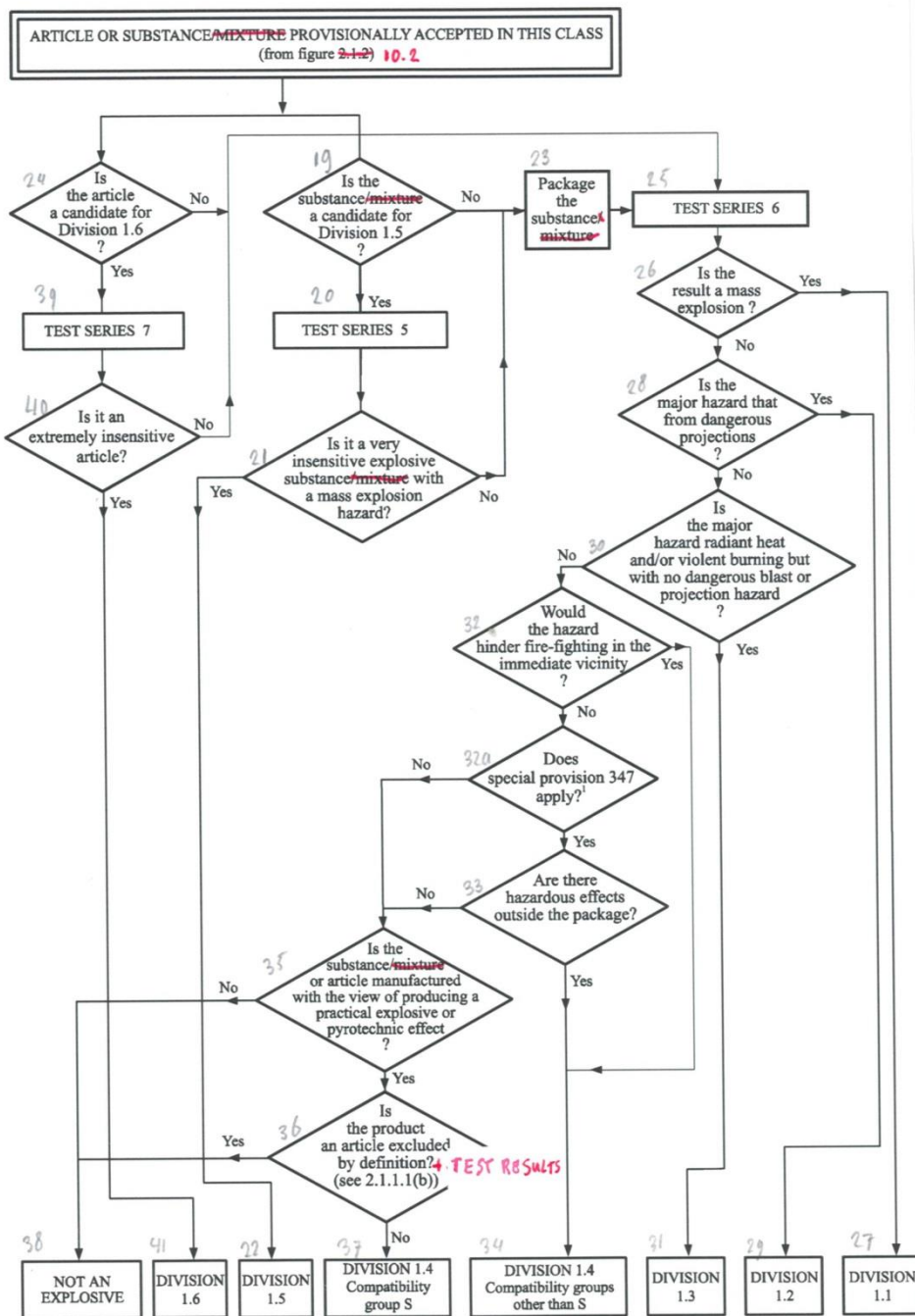


Figure 10.4: PROCEDURE FOR AMMONIUM NITRATE EMULSION, SUSPENSION OR GEL, INTERMEDIATE FOR BLASTING EXPLOSIVES

10.4

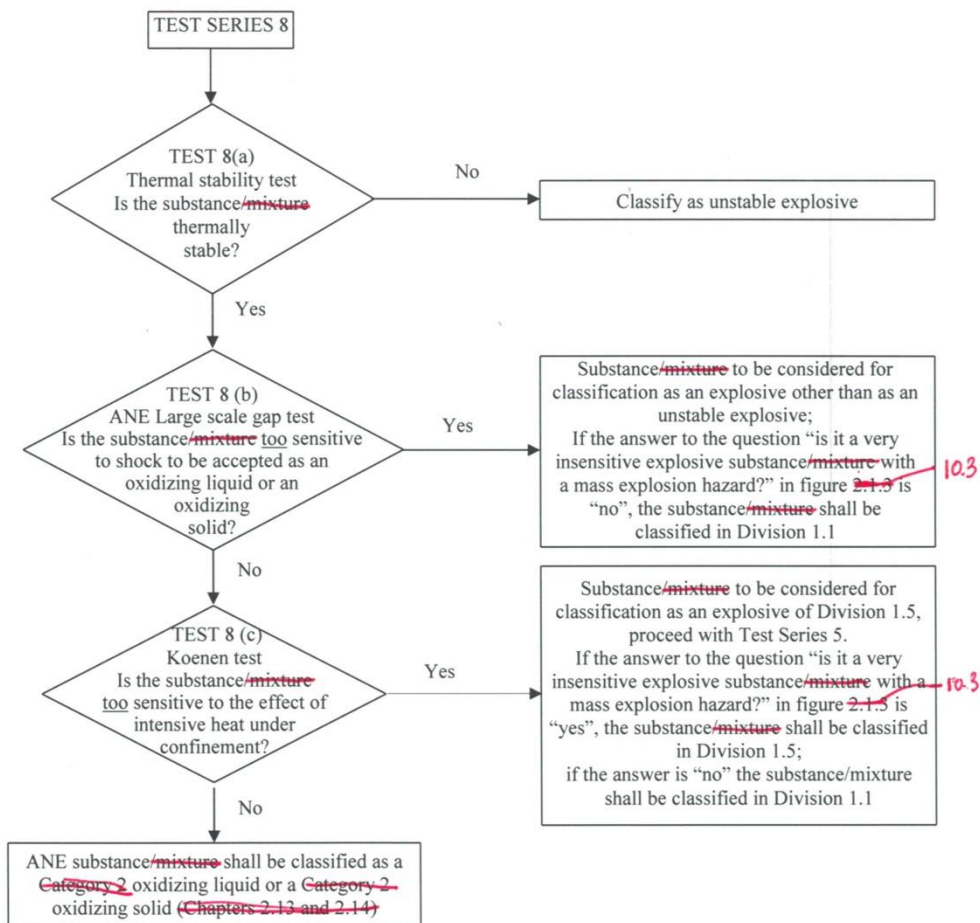
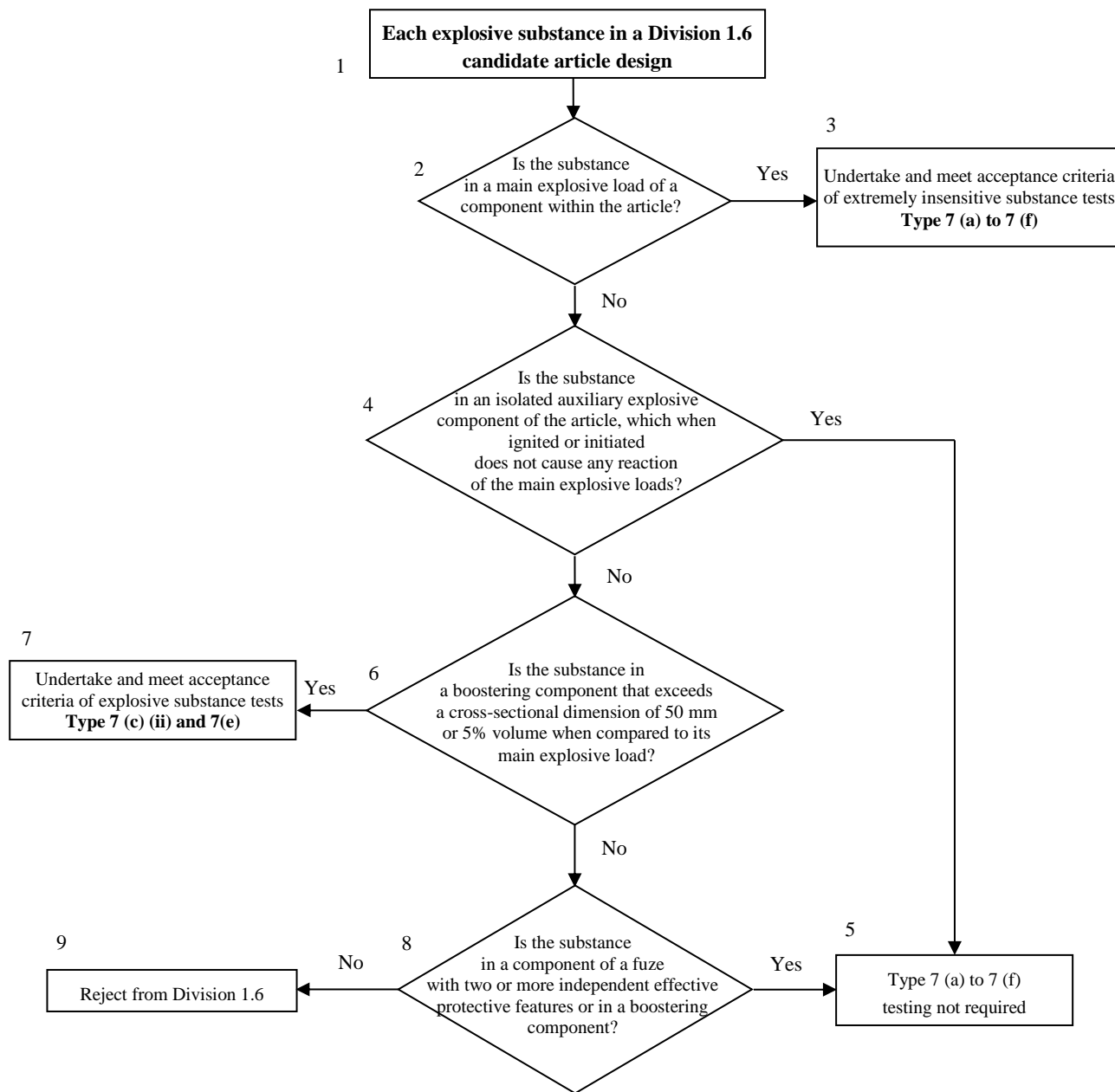


Figure 10.5: PROCEDURE TO DETERMINE REQUIRED SUBSTANCE TESTING FOR DIVISION 1.6



10.4.2.3 The results from four types of series 6 tests, as appropriate, are used to determine which division, amongst Divisions 1.1, 1.2, 1.3 and 1.4, corresponds most closely to the behaviour of a product in a certain configuration if a load is it is involved in a fire resulting from internal or external sources or an explosion from internal sources (boxes 26, 28, 30, 32, 32a and 33 of Figure 10.3). The results are also necessary to assess whether a product in a certain configuration can be assigned to Compatibility Group S of Division 1.4 and whether or not it should-can be excluded from the class of explosives Class 1 (boxes 35 and 36 of Figure 10.3). The four types of test are:

- Type 6 (a): a test on a single package to determine if there is mass explosion of the contents;
- Type 6 (b): a test on packages of an explosive substance or explosive articles, or non-packaged explosive articles, to determine whether an explosion is propagated from one package to another or from a non-packaged article to another;
- Type 6 (c): a test on packages of an explosive substance or explosive articles, or non-packaged explosive articles, to determine whether there is a mass explosion or a hazard from dangerous projections, radiant heat and/or violent burning or any other dangerous effect when involved in a fire; and
- Type 6 (d): a test on an unconfined package of explosive articles to which special provision 347 of Chapter 3.3 of the Model Regulations applies, to determine if there are hazardous effects outside the package arising from accidental ignition or initiation of the contents.

10.4.2.4 The question "Is it an extremely insensitive explosive article?" (box 40, Figure 10.3) is answered by series 7 tests and any candidate for Division 1.6 should-shall pass one of each of the eleven types of test comprising the series. The protocol for determining the test requirements is given in Figure 10.5. The first six types of test (7(a) to 7(f)) are used to establish if a substance is an Extremely Insensitive Substance (EIS). The purpose of these tests is to develop an understanding of the sensitivity of substance(s) contained within the article, which informs and provides confidence in the article tests. The remaining five types of test (7(g), 7(h), 7(j), 7 (k) and 7 (l)) are used to determine if an article predominantly containing an EIS may be assigned to Division 1.6. The eleven test types are:

- Type 7 (a): a shock test to determine the sensitivity to intense mechanical stimulus;
- Type 7 (b): a shock test with a defined booster and confinement to determine the sensitivity to shock;
- Type 7 (c): a test to determine the sensitivity of the explosive substance to deterioration under the effect of an impact;
- Type 7 (d): a test to determine the degree of reaction of the explosive substance to impact or penetration resulting from a given energy source;
- Type 7 (e): a test to determine the reaction of the explosive substance to an external fire when the material is confined;
- Type 7 (f): a test to determine the reaction of the explosive substance in an environment in which the temperature is gradually increased to 365 °C;
- Type 7 (g): a test to determine the reaction to an external fire of an article which is in the condition as presented for transportclassification;
- Type 7 (h): a test to determine the reaction of an article in an environment in which the temperature is gradually increased to 365 °C;
- Type 7 (j): a test to determine the reaction of an article to impact or penetration resulting from a given energy source;
- Type 7 (k): a test to determine whether the detonation of an article will initiate a detonation in an adjacent, like, article; and
- Type 7 (l): a test to determine the sensitivity of an article to shock directed at vulnerable components.

10.4.2.5 The question "Is the substance a candidate for "ammonium nitrate emulsion or suspension or gel, intermediate for blasting explosives (ANE)?" (box 2(a), Figure 10.2) is answered by series 8 tests and any candidate should pass each of the three tests comprising the series. The three test types are:

- Type 8 (a): a test to determine the thermal stability;
- Type 8 (b): a shock test to determine sensitivity to intense shock;
- Type 8 (c): a test to determine the effect of heating under confinement;

Test series 8 (d) has been included in this section as one method to evaluate the suitability of ANEs for ~~the transport~~ containment in portable tanks as an oxidizing substance.

10.4.3 *Application of the test methods*

10.4.3.1 Explanations of certain terms used in the assignment of divisions and compatibility groups are given in the Glossary in Appendix B of the Model Regulations (e.g. mass explosion, pyrotechnic substance, entire load, total contents, explode, explosion of the total contents).

10.4.3.2 Test series 5 should be used to determine whether a substance can be assigned to Division 1.5. Only those substances which pass all three types of test may be assigned to Division 1.5.

10.4.3.3 Test series 6 should be applied to packages of explosive substances and articles in the condition and form in which they are offered for transport classification. The geometrical arrangement of the products should be realistic in regard to the packing method, ~~and the conditions of transport~~, and should be such as to produce the most ~~disadvantageous~~ severe test results. Where explosive articles are to be carried classified without packaging, the tests should be applied to the non-packaged articles. All types of packaging containing substances or articles should be subjected to the tests unless:

- (a) The product, including any packaging, can be unambiguously assigned to a division by the competent authority on the basis of results from other tests or of available information; or
- (b) The product, including any packaging, is assigned to Division 1.1.

10.4.3.4 Test types 6 (a), 6 (b), 6 (c) and 6 (d) are normally performed in alphabetical order. However, it is not always necessary to follow this order or to conduct all four types of test.

- (a) Test type 6 (a) may be waived if explosive articles are carried classified without packaging or when only one article is in the package, (see also section 10.4.3.4.(d));
- (b) Test type 6 (b) may be waived if, in each type of 6 (a) test, (see also section 10.4.3.4 (d))
 - (i) The exterior of the package is undamaged by internal ~~detonation~~ and/or ignition initiation; or
 - (ii) The contents of the package fail to explode, or explode so feebly as would exclude propagation of the explosive effect from one package to another in test type 6 (b).
- (c) Test type 6 (c) may be waived if, in a type 6 (b) test, there is a practically instantaneous explosion of virtually the total contents of the stack. In such cases the product is assigned to Division 1.1.
- (d) Test type 6 (d) is a test used to determine whether a 1.4S classification is appropriate and is only used if special provision 347 of Chapter 3.3 of the Model Regulations applies. When testing articles to which special provision 347 applies, test type 6 (d) may be performed first. If the results of test type 6(d) indicate that a 1.4S classification is appropriate, then test types 6 (a) and 6 (b) may be waived.

10.4.3.5 If a substance gives a "-" result (no propagation of detonation) in the Series 1 type (a) test, the 6 (a) test with a detonator may be waived. If a substance gives a "-" result (no or slow deflagration) in a Series 2 type (c) test, the 6 (a) test with an igniter may be waived.

10.4.3.6 Tests types 7 (a) to 7 (f) ~~should be~~ used to establish that ~~the an~~ explosive is an extremely insensitive ~~detonating~~ substance and then test types 7 (g), 7 (h), 7 (j), 7 (k) and 7 (l) ~~are~~ used to establish that ~~the~~ articles ~~predominantly~~ containing EIS(s) may be assigned to Division 1.6.

10.4.3.7 Tests of types 7 (g), 7 (h), 7 (j), 7 (k) and 7(l) ~~should be~~ performed to determine if an article with EIS main explosive load(s) and appropriately insensitive boosting components may be assigned to Division 1.6. These tests are applied to articles in the condition and form in which they are offered for ~~transport~~ classification, except that non-explosive components may be omitted or simulated if the competent authority is satisfied that this does not invalidate the results of the tests. The procedure detailing testing requirements is given in Figure 10.5 and some points of explanation are given below.

- (a) Complex articles may contain multiple substances and ~~test types 7(a) to (f) shall this procedure should~~ be completed for all main explosive load and boosting component substances, as appropriate, within the article to be classified in Division 1.6.
- (b) The question "Is the substance in a main explosive load of a component within the article?" (Box 2 of Figure 10.5) is answered by examining the design of the article. Main explosive load substances are those loaded into components within the article that are not fuze, boosting, or isolated auxiliary explosive components. All substances in main explosive loads must "Undertake and meet acceptance criteria of extremely insensitive substance tests, Type 7 (a) to 7 (f)" (Box 3 of Figure 10.5). If a '+' result is obtained for any main explosive load substance to any Type 7 (a) to 7 (f) test, the substance is not an EIS and the answer to the question in Box 24 of Figure 10.3 is "No". The article is not a candidate for Division 1.6.
- (c) Answering the question "Is the substance in an isolated auxiliary explosive component of the article, which when ignited or initiated does not cause any reaction of the main explosive loads?" (Box 4 of Figure 10.5) requires knowledge of the design of the article plus the explosive effects that occur when such components are initiated or ignited, either in their design mode or accidentally. Typically these will be small explosive actuators or pyromechanical devices that produce movement, cutting or opening functions. If the answer is 'yes' to this question, Type 7 (a) to 7 (f) testing is not required for substances in isolated auxiliary explosive components and the article remains a candidate for Division 1.6.
- (d) The question "Is the substance in a boosting component that exceeds a cross-sectional dimension of 50 mm or 5% volume when compared to its main explosive load?" (Box 6 of Figure 10.5) is answered by examining the design of the article. All substances in such larger boosting components, including those contained in explosive components of dual-protected fuzes in an article, must "Undertake and meet acceptance criteria of explosive substance tests, Type 7 (c) (ii) and 7 (e)" (box 7 of Figure 10.5). If a '+' result is obtained for any such larger boosting component substance to either Type 7 (c) (ii) and 7 (e) tests, the answer to the question in Box 24 of Figure 10.3 is "No". The article is not a candidate for Division 1.6.

- (e) The question "Is the substance in a component of a fuze with two or more independent effective protective features or in a boosting component" (Box 8 of Figure 10.5) is answered by an understanding of the design and development of the article. If the answer is 'no', the article is not considered to have suitable intrinsic safety characteristics and the answer to the question in Box 24 of Figure 10.3 is 'No' the article is not a candidate for Division 1.6.

NOTE: Knowledge of the design and explosive effects can be obtained by modelling or indicative tests etc.

10.4.3.8 Test types 8 (a) to 8 (c) should be used to establish whether an ammonium nitrate emulsion or suspension or gel, intermediate for blasting explosives (ANE) may be ~~assigned to Division 5.1~~ accepted as an oxidizing solid or liquid. Substances failing any of the tests may be considered as a candidate for the class of explosives Class 1 in accordance with Figure 10.4.

~~10.4.3.9 If articles contain expensive, inert, control components, these may be replaced by inert components having a similar mass and volume.~~

10.5 Examples of test reports

10.5.1 Examples of test reports, with an illustration of the use of the flow charts on the application of the class of explosives Class 1 acceptance and assignment procedures to ~~musk xylene (UN 2956)~~ hexanitrostilbene (UN0392), are given in figures 10.6 to 10.9.

10.5.2 An example proforma for a test report on articles is given in Figure 10.10.

Figure 10.6: RESULTS FROM APPLICATION OF THE CLASS 1—OF EXPLOSIVES ACCEPTANCE PROCEDURE

1. **Name of substance:** Hexanitrostilbene ~~5 tert-BUTYL-2,4,6-TRINITRO-m-XYLENE (MUSK-XYLENE)~~
2. **General data**
- 2.1 Composition: hexanitrostilbene ~~99% tert-butyl-2,4,6-trinitro-m-xylene~~
- 2.2 Molecular formula: C₁₄H₆N₆O₁₂ ~~C₁₂H₁₅N₃O₆~~
- 2.3 Physical form: Fine-crystalline ~~powder~~
- 2.4 Colour: Pale-yellow ~~orange~~
- 2.5 Apparent density: 840-1700 ~~kg/m³~~
- 2.6 Particle size: 0.1 – 0.3 ~~< 1.7~~ mm
3. **Box 2:** Is the substance manufactured with the view to producing a practical explosive or pyrotechnic effect?
- 3.1 Answer: No ~~Yes~~
- 3.2 Exit: Go to Box 3 ~~8~~
4. ~~Box 3:~~ Test Series 1
- 4.1 ~~Propagation of Detonation:~~ UN-gap test (test 1(a))
- 4.2 ~~Sample conditions:~~ Ambient temperature
- 4.3 ~~Observations:~~ Fragmentation length 40 cm
- 4.4 ~~Result:~~ "+", propagation of detonation
- 4.5 ~~Effect of heating under confinement:~~ Koenen test (test 1(b))
- 4.6 ~~Sample conditions:~~ Mass 22.6 g
- 4.7 ~~Observations:~~ Limiting diameter 5.0 mm
Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s)
- 4.8 ~~Result~~ "+", shows some explosive effects on heating under confinement
- 4.9 ~~Effect of ignition under confinement:~~ Time/pressure test (test 1 (c) (i))
- 4.10 ~~Sample conditions:~~ Ambient temperature
- 4.11 ~~Observations:~~ No ignition
- 4.12 ~~Result:~~ "", no effect on ignition under confinement
- 4.13 ~~Exit:~~ Go to Box 4
5. ~~Box 4:~~ Is it an explosive substance?
- 5.1 ~~Answer from Test Series 1:~~ Yes
- 5.2 ~~Exit:~~ Go to box 5
6. ~~Box 5:~~ Test Series 2
- 6.1 ~~Sensitivity to shock~~ UN-gap test (test 2(a))
- 6.2 ~~Sample conditions:~~ Ambient temperature
- 6.3 ~~Observations:~~ No propagation
- 6.4 ~~Result:~~ "", not sensitive to shock
- 6.5 ~~Effect of heating under confinement:~~ Koenen test (test 2(b))
- 6.6 ~~Sample conditions:~~ Mass 22.6 g
- 6.7 ~~Observations:~~ Limiting diameter 5.0 mm
Fragmentation type "F" (time to reaction 52 s, duration of reaction 27 s)
- 6.8 ~~Result:~~ "+", violent effect on heating under confinement

6.9 Effect of ignition under confinement:	Time/pressure test (test 2 (c) (i))
6.10 Sample conditions:	Ambient temperature
6.11 Observations:	No ignition
6.12 Result:	"", no effect on ignition under confinement
6.13 Exit:	Go to Box 6
7. Box 6:	Is the substance too insensitive for acceptance into Class 1?
7.1 Answer from Test Series 2:	No
7.2 Conclusion:	Substance to be considered for Class 1 (box 8)
7.3 Exit:	Go to Box 9
4. Box 8:	<u>Substance to be considered for the class of explosives</u>
85. Box 9:	Test Series 3
85.1 Thermal stability:	75 °C/48 hour test (test 3 (c))
85.2 Sample conditions:	100 g of substance at 75 °C
85.3 Observations:	No ignition, explosion, self-heating or visible decomposition
85.4 Result:	"", thermally stable
85.5 Impact sensitivity:	BAM fallhammer test (test 3 (a) (ii))
85.6 Sample conditions:	as received
85.7 Observations:	Limiting impact energy 25 J
85.8 Result:	<u>"", not unstable in form tested"</u> , not too dangerous to transport in form tested
85.9 Friction sensitivity:	BAM friction test (test 3 (b) (i))
85.10 Sample conditions:	as received
85.11 Observations:	Limiting load > 240 360 N
85.12 Result:	<u>"", not unstable in form tested"</u> , not too dangerous to transport in form tested
85.13 Ease of deflagration to detonation transition	Small scale burning test (test 3 (d))
85.14 Sample conditions:	Ambient temperature
85.15 Observations:	Ignites and burns slowly
85.16 Result:	<u>"", not unstable in the form in which it was tested"</u> , not too dangerous to transport in form tested
85.17 Exit:	Go to box 10
96. Box 10:	Is the substance thermally stable?
96.1 Answer from test 3(c):	Yes
96.2 Exit:	Go to box 11
107. Box 11:	Is the substance too dangerous for transport <u>unstable</u> in the form in which it was tested?
710.1 Answer from Test Series 3:	No
107.2 Exit:	Go to box 18
118. Conclusion:	PROVISIONALLY ACCEPT INTO <u>THE CLASS OF EXPLOSIVES</u>
118.1 Exit:	Apply the Class 1 assignment procedure <u>for the class of explosives</u>

Figure 10.7: PROCEDURE FOR PROVISIONAL ACCEPTANCE OF **HEXANTROSTILBENE MUSK XYLENE** IN **THE CLASS 1-OF EXPLOSIVES**

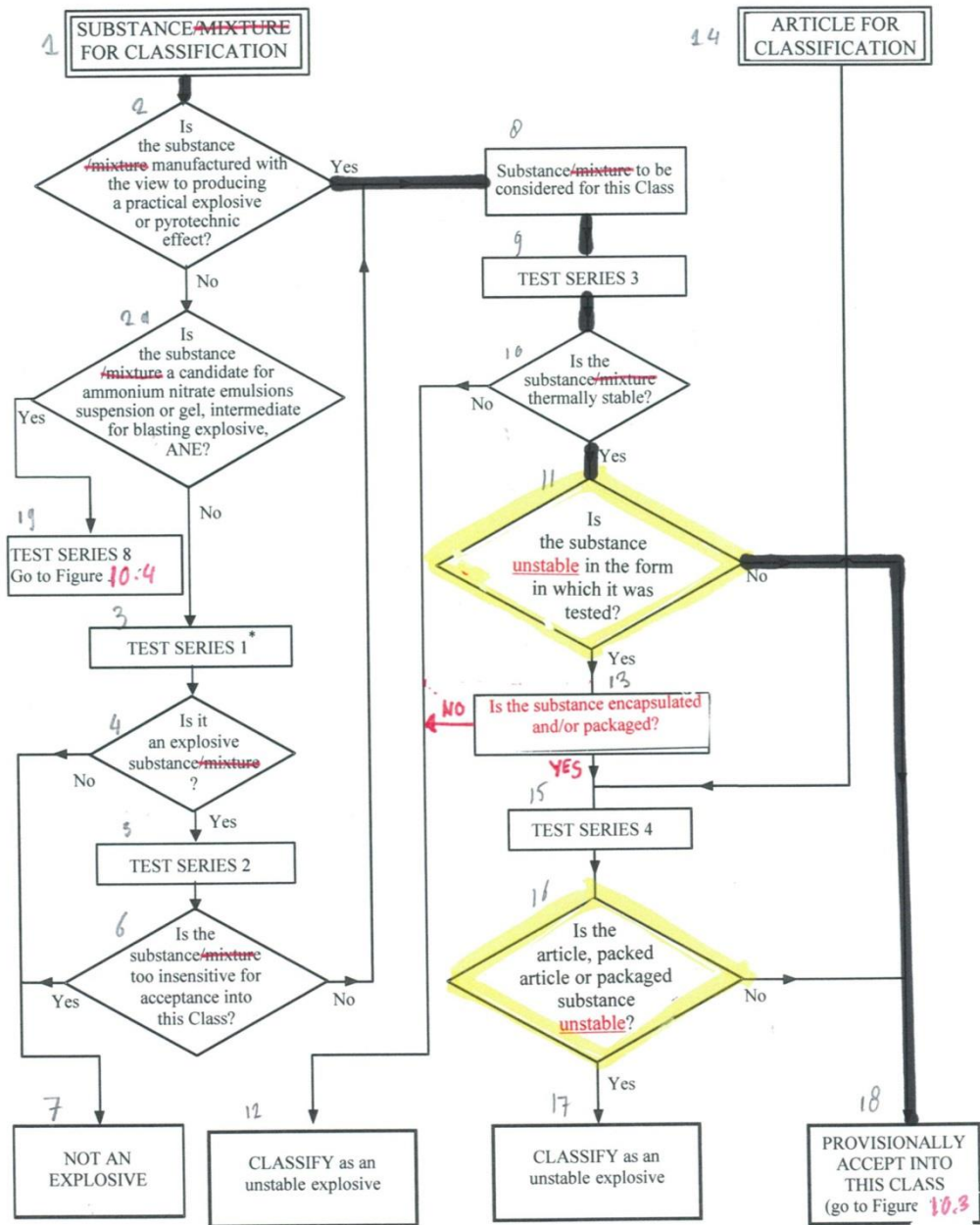


Figure 10.8: RESULTS FROM APPLICATION OF THE ~~CLASS 1~~ CLASS OF EXPLOSIVES ASSIGNMENT PROCEDURE

1. Box 19:	Is the substance a candidate for Division 1.5?
1.1 Answer:	No
1.2 Result:	Package the substance (box 23)
1.3 Exit:	Go to box 25
2. Box 25:	Test Series 6
2.1 Effect of initiation in the package:	Test 6(a) with detonator
2.2 Sample conditions:	Ambient temperature, 50 kg fibreboard drum
2.3 Observations:	Detonation, crater Only localised decomposition around detonator
2.4 Result:	Mass explosion No significant reaction
2.5 Effect of ignition in the package <u>between packages</u> :	Test 6(a) <u>with detonator</u> with igniter
2.6 Sample conditions:	Ambient temperature, 50 kg <u>3</u> fibreboard drums
2.7 Observations:	Detonation, crater Only localised decomposition around igniter
2.8 Result:	Mass explosion No significant reaction
2.9 Effect of propagation between packages:	Type 6(b) test not required as no effect outside package in 6(a) test
2.10 Effect of fire engulfment:	Type Test 6(bc) test not required as no effect outside package in 6(a) test
2.11 Sample conditions:	3 × 50 kg fibreboard drums mounted on steel frame above wooden crib fire
2.12 Observations:	Only slow burning with black smoke occurred
2.13 Result:	No effects which would hinder fire fighting
2.14 Exit:	Go to box 26
3. Box 26:	Is the result a mass explosion?
3.1 Answer from Test Series 6	No <u>Yes</u>
3.2 Exit	Go to box 28 <u>27</u>
4. Box 28:	Is the major hazard that from dangerous projections?
4.1 Answer from Test Series 6:	No
4.2 Exit:	Go to box 30
5. Box 30:	Is the major hazard radiant heat and/or violent burning but with no dangerous blast or projection hazard?
5.1 Answer from Test Series 6:	No
5.2 Exit:	Go to box 32
6. Box 32:	Is there nevertheless a small hazard in the event of ignition or initiation?
6.1 Answer from Test Series 6:	No
6.2 Exit:	Go to box 32a
7. Box 32a:	Does special provision 347 apply?
7.1 Answer:	No
7.2 Exit:	Go to box 32a
8. Box 35:	Is the substance or article manufactured with the view to producing a practical explosive or pyrotechnic effect?
8.1 Answer:	No
8.2 Exit:	Go to box 38
9.4. Conclusion	<u>Assign to Division 1.1</u> NOT CLASS 1
9.1 Exit:	Consider for another class/division

Figure 10.9: PROCEDURE FOR CLASSIFICATION OF HEXANITROSTILBENE IN THE CLASS OF EXPLOSIVES
~~EXEMPTION OF MUSK XYLENE FROM CLASS 1~~
~~PROCEDURE FOR CLASSIFICATION OF HEXANITROSTILBENE IN THE CLASS OF EXPLOSIVES~~

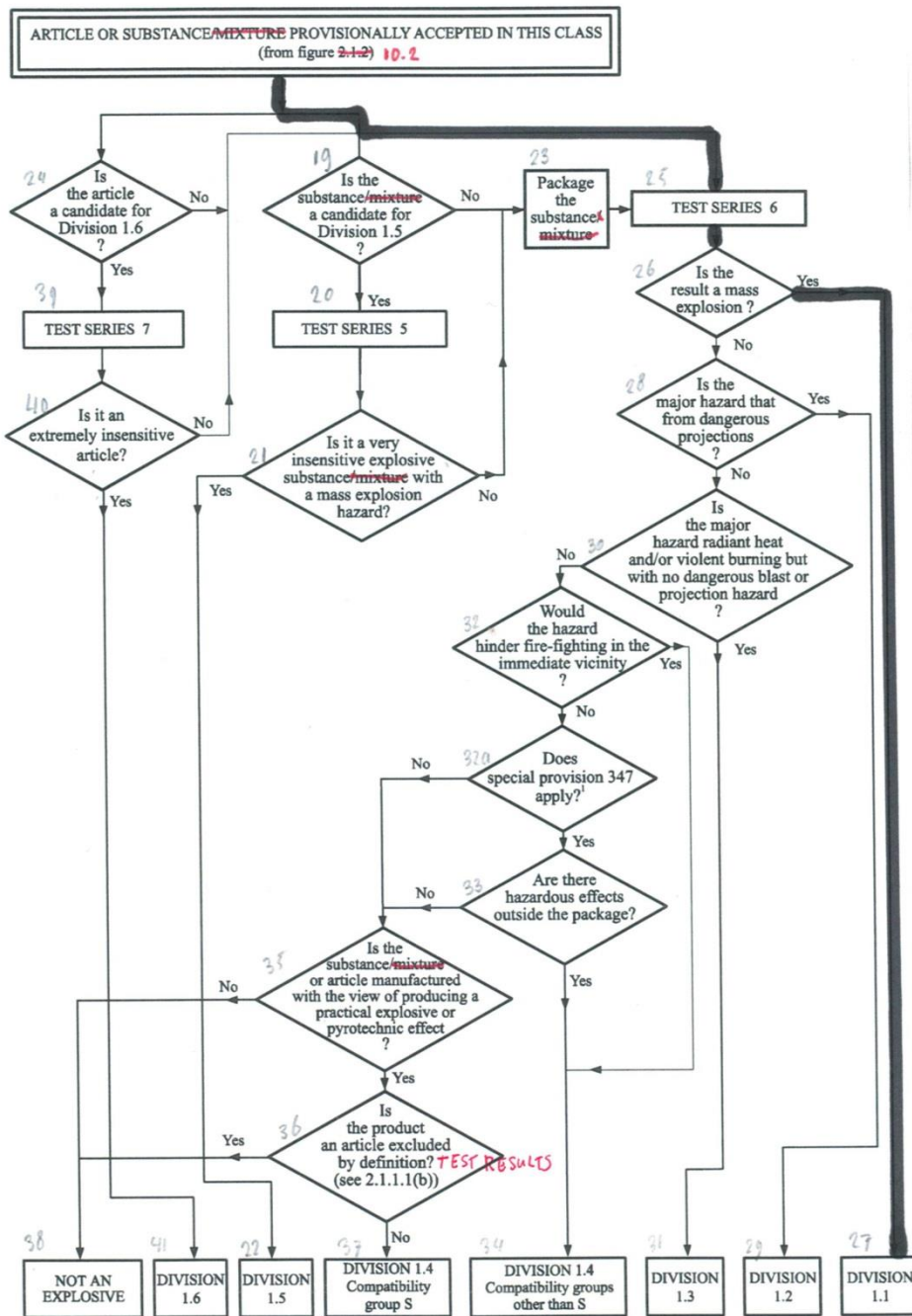


Figure 10.10: EXAMPLE OF A PROFORMA FOR A TEST REPORT FOR ARTICLES

Test method		Date of report		Data reference	
Product name		Lot number		Date of manufacture	

CONSTRUCTION AND CONTENTS (attach drawings)

PACKAGING (if any)

PRETREATMENT OR CONDITIONING (if any)

TEST CONFIGURATION (including any variations or deviations from procedures described in the Manual)

TEST CONDITIONS

Ambient temperature:

°C

Relative humidity:

%

OBSERVATIONS

TEST RESULT

CONCLUSION